What is the impact of statistical structure on response time latencies?

Ezgi Oztelcan*, Zion Walker* , and Halle R. Dimsdale Zucker (*=equal contribution)

Psychology Department, Columbia University

Introduction

- Repeated ordered regularities (**statistical structure**) can help facilitate learning and upcoming predictions
- In our daily lives, routines can serve this purpose (e.g., remembering to get the mail after walking the dog in your morning routine)

Ordered Morning Routine

Random Morning Routine

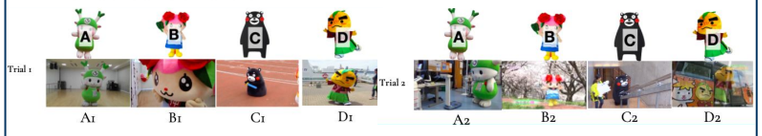
- Events ordered in a statistical pattern are **predictive** of upcoming events within the same pattern (Turk-Browne et. al 2010)
- Ordered patterns can be learned unintentionally (Fiser et. al 2001)
- We can use these regularities to scaffold our behavior even when details change on repetitions (ex. having coffee in a green vs. blue mug) (Turk-Browne et. al 2005)
- Pattern recognition occurs independently of memory for specific events in a pattern (Knowlton et. al 1992)

Hypothesis

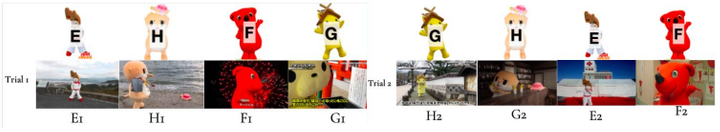
We predict that studying information with an underlying statistical structure will facilitate predictions of upcoming responses.

Study Design

Ordered Condition



Random Condition



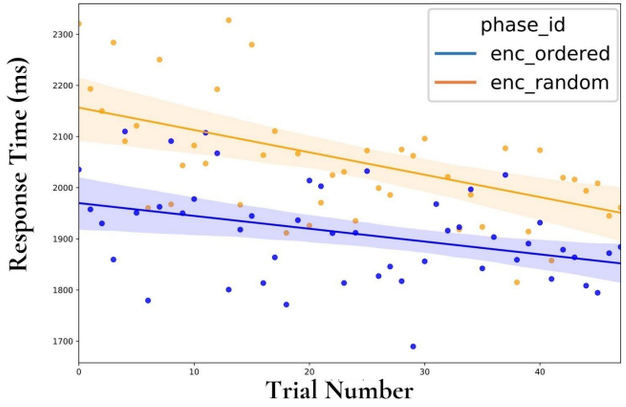
What is the dominant color of this mascot?

Red | Orange | **Green** | Purple

response times for this judgment will be recorded.

Results

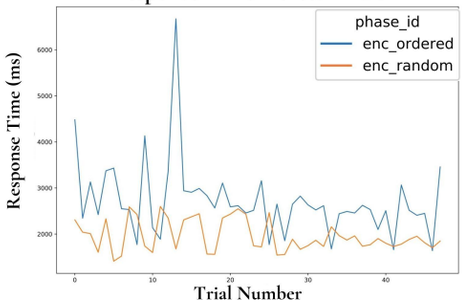
Mean Response Times Across Trials Across Participants



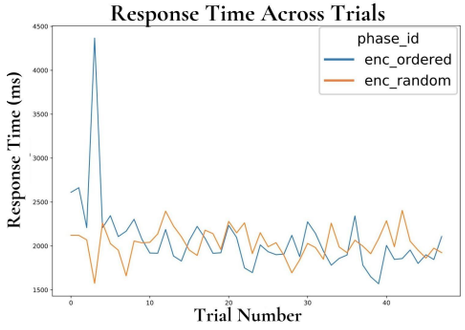
Response times improve (get faster) across trials in the ordered, but not random, condition.

Representative Data for Two Example Subjects

Response Time Across Trials



Response Time Across Trials



There is considerable variability across subjects as to whether we see a response time benefit between ordered and random conditions.

Method

- Data collected for 10 participants online through Prolific
- 48 unique videos in both the ordered and random conditions
- Conditions blocked across participants:
  some see random then ordered, some see ordered then random condition

Discussion

- Across participants, response times decreased across trials for both the random and ordered conditions.
- Although data collection is ongoing, preliminary results suggest that the response times decrease more across trials in the ordered than in the random condition
- This response time benefit could arise because participants are able to use the learned structure to prepare their upcoming response

Next Steps

- Continue to collect data from the participant pool in order to address our hypothesis.
- Test whether maintaining statistical regularities at retrieval improves memory performance.
- Collect functional magnetic resonance imaging (fMRI) to test whether reinstating ordered regularities from encoding at the time of memory retrieval impacts behavior and reshapes brain activity patterns

References

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Knowlton BJ, Ramus SJ, Squire LR. (1992). Intact artificial grammar learning in amnesia: dissociation of classification learning and explicit memory for specific instances. Psychol. Sci. 3, 172–179. (doi:10.1111/j.1467-9280.1992.tb00021.x)

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